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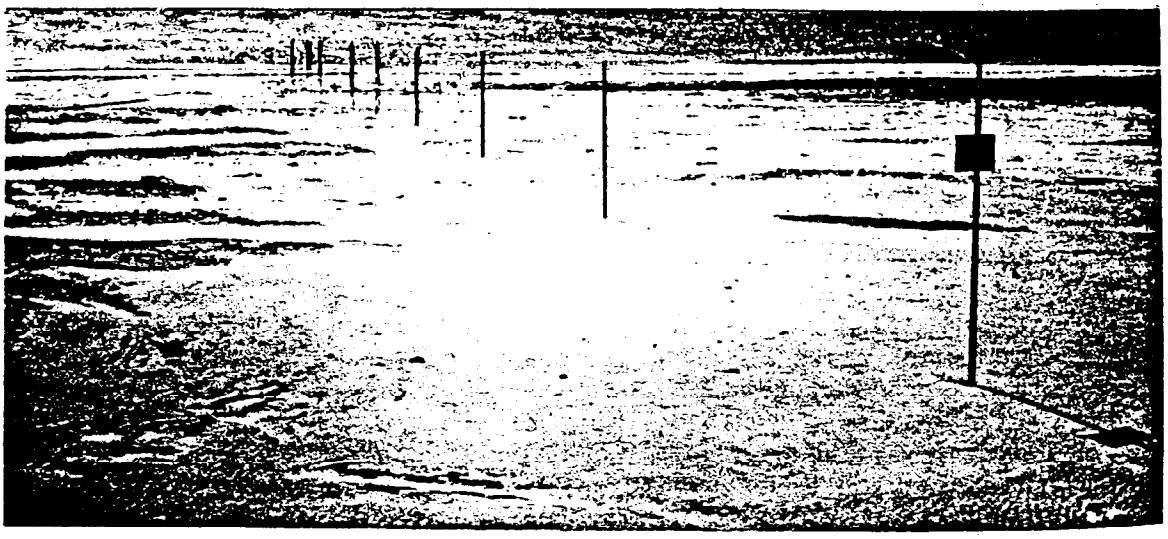
Coastal Engineering Technical Note

PIPE PROFILE METHOD FOR BEACH SURVEYS



Pipe Profile at Atlantic City, New Jersey (March 1969).

PURPOSE: To provide information on the pipe profile method for measuring changes in the beach and nearshore elevations.

GENERAL: Beach profile studies often require installation of pipes on the beach or in the nearshore water for use as references for measuring sand movement.

Structures, such as pilings and groins, may be used for this purpose if they are available in the study area; however, their size and shape may affect sand movement in the vicinity. If such structures are not present, other reference points are required. They should be small enough to be installed easily, yet strong enough to withstand heavy surf. Metal pipes are ideal for this purpose. Low initial cost and ease of installation make them economical and the relatively small diameter (required for strength) has little effect on wave induced velocity fields and sand transport.

The pipe profile surveying method uses rows of pipes perpendicular to the coastline to determine elevation changes along the beach profiles. Tops of the pipes are surveyed to establish elevations which can be used for references for measurements. The pipes are marked (painted, scored, or stamped) at regular intervals to facilitate the measurements. This method is very useful for obtaining accurate profile data through the breaker zone and in the nearshore region. However, safety and logistics problems must be carefully considered before using this technique.

PIPE DESCRIPTION: Galvanized iron pipes are usually used although other types such as PVC (polyvinylchloride) pipes can be used. Other shapes, such as square posts and railroad rails, have been used. Iron pipe has the advantage of being strong enough to resist damage when being driven. It is less vulnerable to vandalism than PVC. Broken pipe can result in dangerous sharp edges. PVC pipe is more easily broken, but broken iron pipe can be more dangerous.

Pipe diameters used have included 1-1/2 inches (DeWall, 1977), 2 inches (Urban and Galvin, 1969), and 4 inches (Queensland, 1982). Disadvantages of the larger pipe, other than higher cost, are: (1) it could cause excessive local scour that may reduce the accuracy of profile measurements and, (2) it would have to withstand greater wave and current forces due to the larger surface area exposed.

Continuous pipe lengths function better than coupled ones since stress concentrations at the couplings tend to cause failure. Vandals may tamper with and remove pipes that are coupled.

INSTALLATION METHODS: In sandy areas, pipes may be installed by a water jet pump or by driving with a sledgehammer. If beach rock is present, a pneumatic jackhammer may be required to install the pipe. A method for driving pipe in beach rock with a jackhammer is described in CERC Bulletin, Vol. III, 1967-69.

ADVANTAGES OF PIPE PROFILE METHOD: Advantages of the pipe profile method over the standard tape and level surveying technique include ease of measuring the same set of points over successive surveys of the profile lines, more rapid surveys, a minimum of crew and equipment, and more accurate data. After the pipes are installed, one person can complete the survey of a beach profile line in less than 5 minutes and a team of 2 divers can survey the nearshore profile

line in about 10 minutes. This diving time is based on 10 pipes along a 500-foot profile under ideal wave conditions with good visibility. Considerably more time may be required on longer profiles in high-energy water. The method is so simple that a minimum of training is required. Unpaid observers with no previous surveying experience have been used on a limited scale.

DISADVANTAGES: Disadvantages of the pipe profile method include a smoothing effect on the surveyed profile shape, the problem of lost or damaged pipes, the possibility of causing a safety hazard, and the difficulty of removing pipes when the study is complete. Accurate measurements of changes between pipes cannot be obtained with the pipe profile method. This may have a significant effect on the variable being analyzed. Standard tape and level techniques can pick up changes in the profile as they occur between the standard-interval stations. A continual problem with the pipe surveying method is damage or loss of pipes, either through natural causes or vandalism. Pipes may need to be marked with warning signs, florescent paint, and flagging. Broken pipe stubs pose a hazard to both unwary bathers and observers. The stubs should be cut off smoothly, rethreaded and a new pipe section coupled to the top. Removal of pipes after data collection is complete poses a problem if pipes are driven into beach rock. In this case, complete profile clearing may require the use of jetting gear, heavy equipment, and/or exploxives.

ADDITIONAL INFORMATION: Call Lee Weishar of the Coastal Engineering Research Center (WESCR-PT) (601) 634-2073 for more information.

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